AMENDMENTS TO THE SPECIFICATION

IN THE SPECIFICATION:

Amend the paragraph beginning on page 1, line 14, as follows:

The reason for this lies in that the quantity of electric currents which flow in the display portion is enlarged because light beams must be emitted more intensely and the number of emission times must be enlarged when a bright image is displayed. When a dark image is displayed, the quantity of electric currents which flow in the display portion is reduced because light beams must be weakened and the number of emission times must be decreased.

Amend the paragraph beginning on page 1, line 22, as follows:

Under circumstances where saving of the energy resources is required ~~in~~from a global viewpoint, e.g., display apparatuses are required to have large-size screens and display apparatuses ~~are attempted to be mounted on~~as used in vehicles and on portable telephones, power saving has been required for the display apparatus. Power saving realizes advantages for users and attains effects to be obtained in that loads which must be borne by the display portion and the power supply circuit of the display apparatus can be reduced, the size of circuit can be reduced and

low-cost elements can be employed. In addition, the lifetime of the display apparatus can be ~~elongated~~extended.

Amend the paragraph beginning on page 7, line 7 as follows:

The conventional current limiting circuit adapted to the plasma display encounters time delay when the pseudo quantity 131 of light to be emitted is smoothed by the smoothing means 32 as shown in Fig. 15. Fig. 18 shows time transition of the pseudo quantity 131 of light to be emitted which takes place in the conventional circuit. As shown in Fig. 18, the pseudo quantity 131 of light to be emitted is obtained in sub-field units. Even if a still image is being displayed, the quantity of light to be emitted from adjacent sub-fields is discontinuous. Therefore, the smoothing process must be performed by the smoothing means 32. If the smoothing process is simply performed by a low-pass filter, the smoothing process, however, inhibits measurement of the quantity of light to be emitted in field units. As a result, time delay takes place. Even if the quantities of light to be emitted are integrated in field units as shown in Fig. 18, the quantity of light to be emitted cannot be extracted only after the integration of the quantity of light to be emitted is completed and movement to a next field is performed. Thus, time delay of one field takes place in performing the control. If the control is delayed as described above, an excessively large current flows in a case where the

quantity of light to be emitted is rapidly ~~enlarged~~increased. In this case, a power supply circuit having a large capacity is required:~~.~~ Thus, ~~there arise a problem in that the cost is enlarged and the weight cannot be reduced~~ increasing cost and limiting the ability to reduce weight.

Amend the paragraph beginning on page 8, line 7, as follows:

Since limitation of the electric current results in the brightness varying, the visual characteristic must be considered. For example, overshooting and slight variation of the controlled variable results in flickers being recognized. Therefore, the current limiting circuit for the plasma display must have high response speed and must avoid noise caused variations ~~occurring attributable to noise~~. The response characteristic of a current control system of the conventional structure depends on ~~a~~ the filtering characteristic of the smoothing means 32. If the smoothing means 32 comprises a simple low-pass filter, ~~raising of the response speed causes a problem to arise in that~~ raising of the response speed results in flickers ~~take~~taking place. The flickers take place because of an influence of variations of the pseudo quantity 131 of light to be emitted in each sub-field and an influence of variation in the waveform of the pseudo quantity 131 of light to be emitted occurring as time elapses attributable to movement of a figure of the bits to the right or left. Another

problem arises in that ~~vary in~~varying the setting of the filter requires a great labor. Even if the quantity of light to be emitted is integrated in field units, the time delay of the process encounters mismatch between the quantity of light to be emitted and the controlled variable. Thus, there arises a problem in that flickers take place.

Amend the paragraph beginning on page 9, line 6, as follows:

To ~~achieve~~resolve the problems experienced with the conventional display apparatus, an object of the present invention is to provide a display apparatus having a current limiting means which is capable of raising the response speed of current limitation while preventing an influence on the visual characteristic.

Amend the paragraph beginning on page 9, line 12, as follows:

A display apparatus according to the present invention ~~is attempted to~~ limits electric currents without any response delay by a using structure comprising a current limiting means for obtaining a quantity of an electric current which must be limited by using time delay occurring because the video signals are temporarily stored in the storage means.~~, the current limiting means being arranged to obtain, in a period of time after the video signal is stored to reading and displaying the video signal, the quantity of~~

~~the electric current which must be limited in accordance with video signals obtained from the video signals before the video signals are stored in the storage means~~The current limiting means achieves the limiting of the electric current within a period of time starting with when the video signal is stored on the storage means and ending with when the video signal is read out and displayed. The current limiting means limits the electric current in dependence on the video signals before they are stored.

Amend the paragraph beginning on page 16, line 11, as follows:

The operation will now be described. The operation which is performed until an image is displayed and the operation which is performed until the number of retained pulses for generating retained discharge to cause the panel to emit light is determined are the same as those of the conventional example. Therefore, the same operations are omitted from description. Only the operation for limiting electric currents will now be described. The average-brightness extracting means 21 adds video signal data 103 output from the video-signal processing means 2 to one another for one field. Then, the average-brightness extracting means 21 performs subtraction of the number of data items obtained by adding and a maximum value of the average value so as to calculate average brightness 121 in one field. Therefore, the range of the average brightness 121 is normalized to a range from 0 to 1 which is

expressed as the average brightness. Even a value obtained by adding video signals can be made to be the same by performing normalization. Fig. 2 shows time transition of the average brightness 121. The average brightness 121 corresponds to the smoothed pseudo quantity 132 of light to be emitted according to the conventional structure. The average brightness 121 is used as an index of an actual quantity of light to be emitted from a panel. Note that the pseudo quantity 132 of light to be emitted according to the conventional structure has time delay. On the other hand, the average brightness 121, which is extracted in front of the storage means, enables the calculation of the average value to be performed during an operation for writing data on the storage means. Therefore, time delay does not take place. Thus, a response is made after display is performed one time with the conventional structure. With the first embodiment, the electric current is limited with display data when display is performed. The pulse control-variable calculating means 22, which will be described later, uses the average brightness 121 and a target value 122 of the quantity of electric currents which must be limited to calculate and output a controlled variable 124 of the number of pulses. Reference numeral 123 represents a response characteristic parameter which enables a parameter of the response characteristic of the pulse control-variable calculating means 22 to be controlled from outside to facilitate variation in the response

characteristic. The controlled variable 124 of the number of pulses ~~is~~, similar~~ly~~ to that ~~according to the~~ in a conventional structure, is expressed by a decimal fraction not less than 0 nor more than 1. Therefore, the controlled variable 124 causes the number of pulses to be retained to be reduced when the multiplying means 12 performs multiplication with the data 111 of the number of pulses to be retained. Therefore, the controlled variable 124 corresponds to the quantity of electric currents which must be limited with which the electric current is limited in proportion as the controlled variable 124 is reduced. If the value of the controlled variable 124 is small, the multiplying means 12 reduces the number of retained pulses. Thus, the number of light emission times from the panel is reduced, and the electric current which flows in the panel is limited.

Amend the paragraph beginning on page 18, line 14, as follows:

The operation of the pulse control-variable calculating means 22 will furthermore be described with reference to Fig. 3. Fig. 3 is a diagram showing the structure of the pulse control-variable calculating means 22 of the display apparatus according to the first embodiment. Referring to Fig. 3, reference numeral 51 represents a multiplying means, 52 represents a deviation detection means, 54 represents a proportionality-term calculating means, 57

represents an addition means, 58 represents a limiter and 59 represents a delay means for delaying one field period.

Amend the paragraph beginning on page 20, line 3, as follows:

The structure of the pulse control-variable calculating means 22 shown in Fig. 3 must finally perform subtraction with the average value 121 of the brightness levels to accurately perform the calculation. To omit a process of subtracting with the average value 121 of the brightness levels which are variables, all of the values of the average value 121 of the brightness levels, the target value 122 of the same and the controlled variables 152, 160 and 124 of the number of pulses are normalized to ~~0 to 1~~be in the range of 0 and 1, inclusive. Thus, a subtracting means is omitted. When the foregoing process is realized by hardware in a case where the original maximum value is an exponent of 2 - 1, the bit shift for normalization can be completed by simply changing the portion to which the wiring is connected. Therefore, the size of the circuit is not substantially enlarged. As a result, a portion of the circuit required to perform the subtraction calculation can be saved.

Amend the paragraph beginning on page 22, line 22, as follows:

The operation will now be described. The integration-term calculating means 55, as shown in Fig. 6, calculates the product of

the deviation 155 and an integration-term constant 163 included in the response characteristic parameter 123 shown in Fig. 1, and then performs integration to output integration-term data 158. The addition means 57 adds proportionality-term data 157, integration-term data 158 and the controlled variable 152 of the number of pulses delayed by one field period to one another to output a controlled variable 160 of the number of pulses.

Amend the paragraph beginning on page 26, line 3, as follows:

The fourth embodiment is described about the structure in which the gap operation is added to the structure according to the second embodiment. The non-linear characteristic providing means 53 may be provided for the pulse control-variable calculating means 22 (see Fig. 3) according to the first embodiment and the pulse control-variable calculating means 22 (see Fig. 75) according to the third embodiment. Also the foregoing structure attains an effect similar to that obtainable from this embodiment.